WORK REQUEST

Please print clearly or type.

Date: Friday, September 07, 2001

Submitter: Robert Waite

Submitter Title: Manager – Advanced Metrology Group

Company: DaimlerChrysler Corporation

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Work Request Number

PP_____-_____/____/____

TITLE OF PROJECT (A brief descriptive title for the project that clearly describes the subject matter.)

CAD DATA INTERFACE – INCLUDING TOLERANCES AND FEATURES – Promote vendor support and conduct pilot testing of a standard design data representation that includes tolerances and features. Mission: Define a complete and unambiguous product definition with enough information to enable down stream metrology to occur.

PROBLEM/OPPORTUNITY (Briefly define the extent of the process, practice, technology that may be developed, or improved through this request.)

The majority of product cost today results from incompatible OEM and supplier systems. Information required for the Inspection process includes surface geometry, feature information, tolerance control frames and coordinate systems. There are different opinions of what constitutes a feature; there is a lack of standardization for tolerance objects incorporated into, and passed with, the CAD model; ultimately, there is the lack of what the industry can call a widely accepted standard infrastructure for tolerances and features. STEP AP 203, which uses boundary representation geometry and is widely supported by CAD vendors, is adequate for nominal shape, but currently does not include tolerance information. STEP AP 224, which is feature-based, does include tolerances and can be used for many parts, but is not able to represent a full range of shapes and is not broadly supported by CAD vendors. STEP AP 214 also includes tolerances and features (although by duplicating AP224 rather than referencing it). Vendor implementations of AP 214 also lag those of AP 203.

The problem with CAD standards development is that each function has developed their own standard format without incorporating the requirements of the whole development process. There is a need to identify the CAD data requirements for dimensional measurement, convey these requirements to appropriate standards development groups, encourage vendor implementation of a standard that meets the requirements (along with those for other processes), and carry out testing to ensure that the standard is adequate and that implementations conform to the standard and achieve interoperability.

PROPOSED SOLUTION [Briefly describe the deliverable (e.g., document, training offering, etc.) or approach that you expect to use to achieve the benefits.]

- Develop specifications/user requirements for tolerance and feature information to be included in design data (e.g., what is needed, how will tolerance data be used). Recruit (3) CAD vendors to participate in the implementation phase.
- Define what will enable this process form a metrologist prospective. Work with PDES, Inc./CAx Implementer Forum to identify/create and encourage vendor implementation of a standard that meets the requirements. Understand where PDES Inc. is on this subject.
- Validate why it is important to have multiple perspectives of features, design, manufacturing and Inspection. Carry out a pilot conformance and interoperability testing program for the standard. The Metrology Test Bed (MTB) will be utilized as a resource for test creation and implementation. Deliverable will be pilot test results.

BENEFIT ESTIMATES (Why is this request important to your company and to the industry? How will it improve quality, efficiency, etc. of the process?)

Design data is the foundation on which downstream activities must rely to build interoperability. The current lack of seamless data exchange severely limits the ability of manufacturing to create and measure parts without extended drawing rework. Automotive suppliers spend at least $200M annually reworking data files; tooling suppliers more than $450M. Auto suppliers believe they could reduce their delivery by four months if they received perfectly interoperable data from OEM's for each new design. Auto OEMs believe they could reduce the design to production time by two months if using perfectly interoperable data. Delayed production costs the industry an estimated $1M per day. A significant portion of these costs (and potential savings) is incurred in inspection process development.

SUPPORT (The submitter's management must support the time commitment for working on the Work Request and implementing the deliverable.)

Please PRINT: name, company, and title of supporting company management.

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Automotive Industry Action Group, 26200 Lahser Road, Suite 200, Southfield, MI 48034
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TITLE OF PROJECT (A brief descriptive title for the project that clearly describes the subject matter.)

INSPECTION PROGRAMMING – Define DMIS 4.0 application profiles and conduct pilot testing to achieve inspection programming which is portable and not system- or tool-dependent. Mission: Develop application specific test suites to verify and promote DMIS portability amongst Computer Aided Design (CAD) software and Dimensional Measuring Equipment (DME).

PROBLEM/OPPORTUNITY (Briefly define the extent of the process, practice, technology that may be developed, or improved through this request.)

The Dimensional Measuring Interface Standard DMIS is the most widely accepted standard in use today for the transmission of inspection programming. The application of DMIS has not been as successful as it could be due to each vendor interpreting the standard in different ways and choosing to implement different parts of the standard. DMIS 4.0 addresses some of these issues, and provides for the definition of application profiles (conformance classes) to enable vendors to implement interoperable subsets of the standard. Fixed conformance classes are needed because it is too time-consuming, expensive, and unreliable for a DMIS user to try to analyze implementer-defined conformance statements in order to determine which implementations fit the user's needs. If there are fixed conformance classes, a body of experience can be built up so that it will be common knowledge among frequent DMIS users which conformance class is required for which type of job. A set of conformance tests is needed because conformance cannot be tested without them. Conformance test suites should be freely available to everyone, especially implementers, so that implementers can assure themselves their implementations are correct before releasing them. Conformance testing services are needed to guard against implementations, which claim to conform but do not.

PROPOSED SOLUTION [Briefly describe the deliverable (e.g., document, training offering, etc.) or approach that you expect to use to achieve the benefits.]

- Develop DMIS 4.0 application profile(s) (conformance classes) and produce Application Profile Documentation.
- Work with vendors to encourage implementation of defined application profile(s).
- Carry out a pilot conformance and interoperability testing program for the application profile(s). The Metrology Test Bed (MTB) will be utilized as a resource for test creation and implementation. Deliverable will be completed DMIS 4.0 application profile(s) test results.
- Promote and assist establishment of DMIS conformance testing and training services.
- Continue work to harmonize DMIS and STEP AP 219.

BENEFIT ESTIMATES (Why is this request important to your company and to the industry? How will it improve quality, efficiency, etc. of the process?)

Portable programs would eliminate redundant program generation, which is needed when DMIS implementations are system-dependent. Auto OEMs stand to save millions of dollars that are spent annually to build and rebuild redundant measurement programs for different systems. Delayed production costs the industry an estimated $1M per day, and lack of inspection program interoperability has been known to cause production launch delays of several days or more. Every company that transfers data for Inspection Programming will realize a portion of the efficiency created by this initiative.

SUPPORT (The submitter's management must support the time commitment for working on the Work Request and implementing the deliverable.)

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TITLE OF PROJECT (A brief descriptive title for the project that clearly describes the subject matter.)

COMMON MEASUREMENT DATA FORMAT – Promote vendor support and conduct pilot testing of a standard for reporting measurement results. The standard should support a wide variety of different types of collection devices and should allow companies the freedom to choose report formats.

PROBLEM/OPPORTUNITY (Briefly define the extent of the process, practice, technology that may be developed, or improved through this request.)

Each different metrology device reports information in a different proprietary format. Output from inspection devices must be integrated with CAD data transmitted by multiple CAD systems. Many different proprietary interfaces exist within this infrastructure. Some systems use IGES/STEP data for graphics – some are just lists of data – some can be imported into applications, such as Excel, for processing. No common format exists across industry that will allow for the seamless transfer of measurement report data and graphics, so users have to resort to time-consuming manual manipulation of the data. DaimlerChrysler has funded development work in this area, and there is a related draft XML Document Type Definition (DTD) from the STEP AP 219 effort. The results of these efforts need to be examined and harmonized, and users need to communicate to vendors their need for a common measurement data standard. Testing of implementations of the resulting standard is needed to ensure that the data are transferable, complete, and free of translation errors.

PROPOSED SOLUTION [Briefly describe the deliverable (e.g., document, training offering, etc.) or approach that you expect to use to achieve the benefits.]

- Develop specifications/user requirements for reporting measurement data. Develop an object model describing required information flow leveraging XML.
- Work with vendors to identify/create and encourage vendor implementation of a standard that meets the requirements.
- Carry out a pilot conformance and interoperability testing program for the measurement data standard. The Metrology Test Bed (MTB) will be utilized as a resource for test creation and implementation. Deliverable will be pilot test results.

BENEFIT ESTIMATES (Why is this request important to your company and to the industry? How will it improve quality, efficiency, etc. of the process?)

Standards that dictate common storage of data and graphics will promote development of enhanced, web-based reporting systems that will be prevalent in the e-commerce community of the future. Benefits will be measured in reduced time to make decisions based on available data and information, which has a direct effect on time to market. Common measurement data will reduce delays in upstream and downstream activities by as much as 25%.

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